

U.S. Patent Application Serial No. 10/775,216
Response filed April 28, 2006
Reply to OA dated January 12, 2006

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Original): A multiple output power source apparatus comprising a plurality of power source circuits equipped with independent output control circuits, wherein

the power source circuits equipped with independent output control circuits respectively comprises:

abnormality signal output means for conducting operation shutdown of own circuit when an abnormality occurs in the own circuit and for outputting an abnormality signal to other power source circuits.

Claim 2 (Original): The multiple output power source apparatus according to claim 1, wherein

the plurality of power source circuits equipped with the independent output control circuits further comprise:

abnormality signal input means for inputting the abnormality signal outputted from other power source circuit; and

operation shutdown means for conducting the operation shutdown of the own circuit by the input of the abnormality signal by the abnormality signal input means.

Claim 3 (Original): The multiple output power source apparatus according to claim 2, wherein the abnormality signal output means and the abnormality signal input means conduct input and output of the abnormality signal by using a single terminal.

Claim 4 (Original): The multiple output power source apparatus according to claim 2,

wherein operation of a power source circuit selected from the plurality of power source circuits equipped with the independent output control circuits is continued by the independent output control circuit even when the abnormality signal has been outputted from the other power source circuits.

Claim 5 (Currently Amended): A multiple output power source apparatus comprising a plurality of power source circuits equipped with independent output control circuits, wherein

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the power source circuits equipped with independent output control circuits respectively comprises:

synchronous oscillation signal output means for outputting a synchronous oscillation signal synchronized with switching oscillation frequency of own circuit to output control circuits of other power source circuits;

a drive circuit that generates a switching signal for controlling an output voltage; and
a voltage monitoring circuit that monitors the output voltage thereby to control the
switching signal generated from the drive circuit whereby the output voltage is stably controlled to
a desired voltage.

Claim 6 (Original): The multiple output power source apparatus according to claim 5, wherein

the plurality of power source circuits equipped with the independent output control circuits further comprise:

synchronous oscillation signal input means for inputting a synchronous oscillation signal outputted from other power source circuit; and

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control means for conducting synchronous control of a switching oscillation frequency used in output control of the own circuit by inputting the synchronous oscillation signal by the synchronous oscillation signal input means.

Claim 7 (Original): The multiple output power source apparatus according to claim 6, wherein the synchronous oscillation signal output means and the synchronous oscillation signal input means conduct input and output by using a single terminal.

Claim 8 (Currently Amended): The multiple output power source apparatus according to claim 6, wherein

operation of a power source circuit selected from the plurality of power source circuits equipped with the independent output control circuits is continued by the independent output control circuit even when ~~[[the]]~~ an abnormality signal has been outputted from the other power source circuits.

Claim 9 (Original): The multiple output power source apparatus according to claim 6, wherein the plurality of power source circuits equipped with the independent output control circuits respectively comprises:

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control means for synchronously controlling a switching phase used for output control of the own circuit by a switching phase of the synchronous oscillation signal by the synchronous oscillation signal input means.

Claim 10 (Currently Amended): A multiple output power source apparatus comprising a plurality of power source circuits, wherein

at least two of the plurality of power source circuits are connected by a synchronous line,

first and second power source circuits connected by the synchronous line comprise independent control circuits, respectively,

the control circuit provided in the first power source circuit comprises:

synchronous signal output means for outputting a synchronous signal synchronized with the switching frequency of own circuit to the synchronous line; and

abnormality signal output means for outputting an abnormality signal indicating the abnormality occurrence in the own circuit to the synchronous line;

a drive circuit that generates a switching signal for controlling an output voltage; and

a voltage monitoring circuit that monitors the output voltage thereby to control the switching signal generated from the drive circuit whereby the output voltage is stably controlled to a desired voltage.

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the control circuit provided in the second power source circuit comprises:

synchronous signal input means for inputting the synchronous signal outputted to the synchronous line into the own circuit; and

abnormality signal input means for inputting the abnormality signal outputted to the synchronous line into the own circuit;

a drive circuit that generates a switching signal for controlling an output voltage; and
a voltage monitoring circuit that monitors the output voltage thereby to control the
switching signal generated from the drive circuit whereby the output voltage is stably controlled to
a desired voltage.

Claim 11 (Original): The multiple output power source apparatus according to claim 10, wherein

the control circuit provided in the first power source circuit further comprises abnormality signal input means for inputting the abnormality signal outputted to the synchronous line into the own circuit,

the control circuit provided in the second power source circuit further comprises abnormality signal output means for outputting the abnormality signal indicating the abnormality occurrence in the own circuit to the synchronous line, and

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the first and second power source circuits shut down the own circuits when the abnormality signal has been inputted from the synchronous line.

Claim 12 (Currently Amended): A multiple output power source apparatus comprises a plurality of power source circuits, wherein

at least two of the plurality of power source circuits are connected by a synchronous line,

first and second power source circuits connected by the synchronous line comprise independent control circuits, respectively,

the control circuits provided in the first and second power source circuits respectively comprise:

frequency synchronization means for controlling switching frequency of own circuit by using a synchronous signal outputted to the synchronous line; and

abnormality signal detection means for detecting ~~[[the]]~~ an abnormality signal outputted to the synchronous line and shutting down the own circuit;

a drive circuit that generates a switching signal for controlling an output voltage; and

a voltage monitoring circuit that monitors the output voltage thereby to control the switching signal generated from the drive circuit whereby the output voltage is stably controlled to a desired voltage.

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Claim 13 (Original): The multiple output power source apparatus according to claim 12, wherein

the synchronous signal comprises a clock signal of a predetermined frequency,
the abnormality signal is generated by changing the clock signal, and
the abnormality signal detection means detects change of the clock signal.

Claim 14 (Original): The multiple output power source apparatus according to claim 13, wherein

the change of the clock signal is generated by the first power source circuit and/or second power source circuit.

Claim 15 (Original): The multiple output power source apparatus according to claim 13, wherein

the change of the clock signal is implemented by stopping the clock signal, and
the abnormality signal detection means measures an interval during which the clock signal is stopped and shuts down the own circuit when it is detected that the stop state continues for a predetermined interval or longer.

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Claim 16 (Original): The multiple output power source apparatus according to claim 13, wherein

the change of the clock signal is implemented by changing a voltage level of the clock signal, and

the abnormality signal detection means measures the voltage level of the clock signal and shuts down the own circuit when a predetermined voltage level is detected.